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PRIORITY DATE CLAIMED

October 29, 1999

TITLE OF INVENTION

COMMUNICATION APPARATUS AND COMMUNICATION METHOD

APPLICANT(S) FOR DO/EO/US

Yoji YOKOYAMA

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (24) indicated below.
4. ☐ The US has been elected by the expiration of 19 months from the priority date (Article 31).
5. ☒ A copy of the International Application as filed (35 U.S.C. 371 (c) (2))
 - a. ☐ is attached hereto (required only if not communicated by the International Bureau).
 - b. ☒ has been communicated by the International Bureau.
 - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☐ An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).
 - a. ☐ is attached hereto.
 - b. ☐ has been previously submitted under 35 U.S.C. 154(d)(4).
7. ☐ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371 (c)(3))
 - a. ☐ are attached hereto (required only if not communicated by the International Bureau).
 - b. ☐ have been communicated by the International Bureau.
 - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
 - d. ☐ have not been made and will not be made.
8. ☐ An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☐ An oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4)).
10. ☐ An English language translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371 (c)(5)).
11. ☐ A copy of the International Preliminary Examination Report (PCT/IPEA/409).
12. ☒ A copy of the International Search Report (PCT/ISA/210).

Items 13 to 20 below concern document(s) or information included:

13. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
14. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
15. ☐ A **FIRST** preliminary amendment.
16. ☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
17. ☐ A substitute specification.
18. ☐ A change of power of attorney and/or address letter.
19. ☐ A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821 - 1.825.
20. ☐ A second copy of the published international application under 35 U.S.C. 154(d)(4).
21. ☐ A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).
22. ☐ Certificate of Mailing by Express Mail
23. ☒ Other items or information:

Claim for Priority with PCT/IB/304

PCT/IB/308

PCT/RO/101

APPLICATION NO. (IF KNOWN, SEE 37 CFR

INTERNATIONAL APPLICATION NO.

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PCT/JP00/07536

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24. The following fees are submitted:

BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)) :

- ☐ Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO \$1000.00
- ☒ International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO \$860.00
- ☐ International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO \$710.00
- ☐ International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4) \$690.00
- ☐ International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4) \$100.00

ENTER APPROPRIATE BASIC FEE AMOUNT =

\$860.00

Surcharge of \$130.00 for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (e)).

\$0.00

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE
Total claims	9 - 20 =	0	x \$18.00
Independent claims	4 - 3 =	1	x \$80.00

\$0.00

\$80.00

Multiple Dependent Claims (check if applicable). ☐

\$0.00

TOTAL OF ABOVE CALCULATIONS =

\$940.00

Applicant claims small entity status. (See 37 CFR 1.27). The fees indicated above are reduced by 1/2.

\$0.00

SUBTOTAL =

\$940.00

Processing fee of \$130.00 for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (f)).

\$0.00

TOTAL NATIONAL FEE =

\$940.00

Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31) (check if applicable). ☒

\$40.00

TOTAL FEES ENCLOSED =

\$980.00

Amount to be:

refunded \$

charged \$

- a. ☒ A check in the amount of \$980.00 to cover the above fees is enclosed.
- b. ☐ Please charge my Deposit Account No. _____ in the amount of _____ to cover the above fees. A duplicate copy of this sheet is enclosed.
- c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 19-4375. A duplicate copy of this sheet is enclosed.
- d. ☐ Fees are to be charged to a credit card. **WARNING:** Information on this form may become public. **Credit card information should not be included on this form.** Provide credit card information and authorization on PTO-2038.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

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REGISTRATION NUMBER

June 27, 2001

DATE

DESCRIPTION

COMMUNICATION APPARATUS AND COMMUNICATION METHOD

5 Technical Field

The present invention relates to a communication apparatus and a communication method, and more particularly to a communication apparatus and a communication method to be used for multimedia communication in International
10 Telecommunication Union (ITU).

Background Art

Conventionally, in digital communication, multimedia communication is performed through the
15 following processes. That is, moving picture data, voice data and other data are compressed in conformity with a compression system of a prescribed standard; image data stream, voice data stream and other data stream that were obtained by the compression are multiplexed; and the
20 multiplexed stream data is transmitted.

Before the transmission of the stream data, control data is exchanged between communication terminals in regard to a moving picture coding system, a voice coding system, a data transmission system, or the like. Then, after the
25 communication system to be performed within the abilities of the communication terminals is determined, resources necessary for the communication are prepared. Not until

these processes are completed the transmission of the stream data is begun.

As for the exchanges of the control data before the beginning of the transmission of the stream data, ITU-T standard H. 245 (hereinafter, referred as to "H. 245 standard") is currently used. This standard is a communication control protocol that was developed for AV multimedia communication using packet multiplexing, and is adopted by many multimedia communication terminals.

10 In the H. 245 standard, after the beginning of communication, at first, the exchanges of control data concerning the abilities of communication terminals and reception acknowledgment signals with regard to the control data are performed between communication terminals, and
15 the exchanges of the information for the determination of the classification of the communication terminals and the superiority or inferiority of the communication terminals are performed. These exchange steps are called as "transmission starting phase 1". In the transmission
20 starting phase 1, exchanges of control data and reception acknowledgment signals concerning the control data are performed as many times as the number of media (voice, image, and so forth). After the transmission starting phase 1, the abilities of transmitter-receiver terminals
25 are settled, and the logical connection of each medium is established. This step is called as "transmission starting phase 2". After the completion of the

transmission starting phase 2, the exchange of multiplexing information for the packet multiplexing of data and a reception acknowledgment signal with regard to the multiplexing information is performed. This exchange is
5 called as "transmission starting phase 3". Not until all of these processes of the transmission starting phases 1-3 are completed the transmission of the stream data is begun.

However, the H. 245 standard adopts an acknowledgment
10 type process configuration such that, after a communication terminal transmitted control data to a communicating party and received the reception acknowledgment signal (ACK, NACK) of the control data from the communicating party, the communication terminal transmits the next control data.
15 Such a process configuration guarantees the sure transmission of control data. However, such a process configuration has a problem such that the larger the number of control data necessary for being exchanged before the beginning of the transmission of stream data becomes, the
20 longer the necessary time before the beginning of the transmission of the stream data becomes. Incidentally, in the H. 245 standard, generally, after about twenty control data were exchanged, the transmission of stream data is begun. Hereinafter, the problem is described in
25 detail with the aid of FIG. 1.

FIG. 1 is a sequence diagram showing a state of exchanging of control data between communication terminals

equipped with a conventional communication apparatus severally. In FIG. 1, at the timing (hereinafter, abbreviated to as "t") t1 and t21, communication terminals A and B respectively transmit control data A-1 and control data B-1 to the other parties of communication.

Incidentally, the problem is described in the following description on the basis of the operation of the communication terminal A for convenience of description.

After the communication terminal A transmitted the control data A-1, the communication terminal A generates control data A-2 to be transmitted at the next time. When the communication terminal B received the control data A-1 at t22, the communication terminal B transmits a reception acknowledgment signal 1 to the communication terminal A as a reply. When the communication terminal A received the reception acknowledgment signal 1 at t13, it becomes possible for the communication terminal A to transmit the next data. Accordingly, the communication terminal A transmits response data to an inquiry in the control data B-1 that the communication terminal A received at t12 to the communication terminal B at t13. Now, it is supposed that the preparation of the transmission of the control data A-2 to be transmitted from the communication terminal A at the next time has already completed at t13 in the communication terminal A.

When the communication terminal B received the response data at t23, the communication terminal B

transmits a reception acknowledgment signal 2 to the communication terminal A as a reply. When the communication terminal A received the reception acknowledgment signal 2 at t14, it becomes possible for the communication terminal A to transmit the next data. Consequently, the communication terminal A transmits the control data A-2 the transmission preparation of which has completed at t13 at t14.

As described above, because the communication terminal A cannot transmits control data A-2 before the reception of the reception acknowledgment signal 2 in the H. 245 standard, a waiting time shown in FIG. 1 is generated with respect to the transmission of the control data A-2.

The larger the number of control data necessary to be exchanged before the beginning of the transmission of stream data becomes, the higher the frequency of generation of such a waiting time becomes. Consequently, the larger the number of control data becomes, the longer the necessary time before the beginning of the transmission of stream data becomes.

Disclosure of Invention

An object of the present invention is to supply a communication apparatus and a communication method that can shorten the waiting time concerning the transmission of control data and that can reduce the delay of the beginning of the transmission of stream data.

For attaining the aforesaid object, the present invention is configured so as to decrease the number of times of exchanges of control data by transmitting a plurality of control data that can be transmitted before
5 the arrival of response data from the communicating party as one multiplexing unit in a multiplexed state.

Brief Description of Drawings

FIG. 1 is a sequence diagram showing a state of
10 exchanges of control data by communication terminals equipped with a conventional communication apparatus, severally;

FIG. 2 a principal part block diagram showing a schematic configuration of a communication apparatus
15 according to Embodiment 1 of the present invention;

FIG. 3 is a diagram showing an example of the contents of a table stored in the correlation memory section of the communication apparatus according to Embodiment 1 of the present invention;

FIG. 4 is a sequence diagram showing a sate of the
20 exchanges of control data by communication terminals equipped with the communication apparatus according to Embodiment 1 of the present invention, severally;

FIG. 5 is a principal part block diagram showing
25 another schematic configuration of the communication apparatus according to Embodiment 1 of the present invention;

FIG. 6 is a principal part block diagram showing a schematic configuration of a communication apparatus according to Embodiment 2 of the present invention;

FIG. 7 is a sequence diagram showing a state of exchanges of control data by communication terminals equipped with the communication apparatus according to Embodiment 2 of the present invention, severally;

FIG. 8 is a principal part block diagram showing a schematic configuration of a communication apparatus according to Embodiment 3 of the present invention; and

FIG. 9 is a sequence diagram showing a state of exchanges of control data by communication terminals equipped with the communication apparatus according to Embodiment 3 of the present invention, severally.

Best Mode for Carrying Out the Invention

In the following, embodiments of the present invention are described in detail by reference to the attached drawings.

(EMBODIMENT 1)

The communication apparatus and the communication method according to Embodiment 1 of the present invention correlate a plurality of control data that can collectively be transmitted and a plurality of control data that are asynchronously generated, and the apparatus and the method multiplex the plural control data in conformity with the correlation to be one packet, and then the apparatus and

the method transmit the packet.

Hereinafter, the communication apparatus and the communication method according to Embodiment 1 of the present invention are described by means of FIG. 2. FIG. 2 is a principal part block diagram showing a schematic configuration of the communication apparatus according to Embodiment 1 of the present invention.

A control data management section 102 that was instructed by a terminal control section 101 to start to communicate outputs a transmission instruction of control data to a control data transmission section 103. The control data transmission section 103 that received the transmission instruction generates transmission control data to output the generated transmission control data to a control data synchronization section 104.

When control data necessary for being transmitted successively exist, the control data management section 102 again transmits the transmission instruction to the control data transmission section 103. Receiving the transmission instruction, the control data transmission section 103 again generates transmission control data to output the generated transmission control data to the control data synchronization section 104.

The control data synchronization section 104 cooperates with a correlation memory section 105 and a control data accumulation section 106 to multiplex a plurality of transmission control data. The multiplexed

transmission control data is output to the control data management section 102. Incidentally, the operation of the multiplexing will be described later.

The data output to the control data management section 102 is output to a control data processing section 107 by the control data management section 102, and then the output data is temporarily stored in a multiplexed data accumulation section 108. Then, when the control data processing section 107 detected the reception of a reception acknowledgment signal transmitted from the communicating party, the control data processing section 107 takes out multiplexed transmission control data from the multiplexed data accumulation section 108 and adds a sequence number, an error detection code and the like to the taken out transmission control data to generate the added control data as one packet. Consequently, the packet includes a plurality of transmission control data. After header information and other information were added to the generated packet in the transmission section 109, the packet is processed in conformity with prescribed radio processing in the transmission section 109, and the processed packet is transmitted to the communicating party through an antenna 110.

On the other hand, after control data that were received through the antenna 110 were processed in conformity with prescribed radio processing in the transmission section 109, the processed control data is

output to the control data processing section 107. The control data processing section 107 performs the processing of the received control data such as error detection. When the received control data were correctly received, the control data processing section 107 outputs a reception acknowledgment signal to the transmission section 109, and further the control data processing section 107 outputs the received control data to the control data management section 102. After being processed in conformity with the prescribed radio processing in the transmission section 109, the reception acknowledgment signal is transmitted to the communicating party through the antenna 110.

The control data management section 102 outputs the received control data output from the control data processing section 107 to a control data reception section 111. The control data reception section 111 analyzes the contents of the received control data. When a response is needed to an inquiry in the received control data, the control data reception section 111 generates response data and output the generated response data to the control data synchronization section 104. Incidentally, in the following description, transmission control data to be generated by the control data transmission section 103 and response data to be generated by the control data reception section 111 is generically named as "control data". Moreover, data generated by the multiplexing of a plurality of control data is called as "multiplexed

control data".

The control data synchronization section 104 cooperates with the correlation memory section 105 and the control data accumulation section 106 to multiplex
5 response data and transmission control data. The multiplexed data is output to the control data management section 102. Incidentally, the operation of the multiplexing will be described later. Because the processing after that until the multiplexed data is
10 transmitted is similar to that described above, the description concerning the processing is omitted.

In such a way, after the completion of the exchanges of control data in each transmission starting phase between communication terminals equipped with the aforesaid
15 communication apparatus severally, the transmission of stream data such as voice data and image data is started. That is, after the completion of the exchanges of control data, the terminal control section 101 outputs a starting signal to a user data processing section 112, and thereby
20 the user data processing section 112 is started.

The user data processing section 112 performs the prescribed processing (e.g. operation processing in the MPEG-4 system) of user data such as voice data and image data that is input through the input/output terminal 113,
25 and the user data processing section 112 generates transmission stream data to output the generated transmission stream data to the transmission section 109.

Moreover, after the user data processing section 112 performed the prescribed processing of the received stream data output from the transmission section 109, the user data processing section 112 outputs the processed stream data to another apparatus through the input/output terminal 113.

Next, the multiplexing operation of control data by the control data synchronization section 104, the correlation memory section 105 and the control data accumulation section 106 is described.

In the correlation memory section 105, a prescribed table such as one shown in FIG. 3, in which each control data are correlated by being grouped for each kind (by the message), is stored. FIG. 3 is a diagram showing an example of the contents of a table stored in the correlation memory section of a communication apparatus according to Embodiment 1 of the present invention.

Now, each message that belongs to a certain group in the table shown in FIG. 3 is a message capable of being collectively transmitted to the communicating party. That is, because "terminal ability information exchanging message" is a message capable of being transmitted without the wait of the response data from the communicating party to "master slave determining message", the "master slave determining message" and the "terminal ability information exchanging message" can collectively be transmitted to

the communicating party. Accordingly, the "master slave determining message" and the "terminal ability information exchanging message" are grouped into one group.

On the other hand, because the ability of the communicating party cannot be known without the wait of the response data from the communicating party to the "terminal ability information exchanging message", the "terminal ability information exchanging message" and "logic channel establishing message" cannot collectively be transmitted to the communicating party. Accordingly, the "terminal ability information exchanging message" and the "logic channel establishing message" are grouped into different groups.

Incidentally, the correlation memory section 105 is configured such that the stored contents can adaptively be changed according to communication conditions. That is, when voiceless communication is performed, there is no need to establish any voice logic channel. Accordingly, the table shown in FIG. 3 becomes a table in which "logic channel establishing (voice)" is omitted from the group 2 in the table shown in FIG. 3.

The control data synchronization section 104 accumulates input control data into the control data accumulation section 106 in sequence. When the control data synchronization section 104 accumulates control data, the control data synchronization section 104 judges which group the control data to be accumulated belongs to by

reference to the table that is stored in the correlation memory section 105 and shown in FIG. 3. Then, the control data synchronization section 104 correlates a plurality of control data to each other for each group for managing
5 them as one data by the group. According to such operation, a plurality of control data are multiplexed for each group and are handled as one data by the group.

To put it concretely, for example, when "master slave determining message" is input into the control data
10 synchronization section 104, the control data synchronization section 104 judges that the "master slave determining message" belongs to group 1. Moreover, because "terminal ability information exchanging message" exists after the "master slave determining message" in
15 the group 1, the control data synchronization section 104 can know that the "terminal ability information exchanging message" will successively be input after the "master slave determining message". Accordingly, in this case, the control data synchronization section 104 accumulates the
20 "master slave determining message" into the control data accumulation section 106 as control data that belongs to the group 1.

Moreover, when input control data is data at the last in each group, the control data synchronization section
25 104 accumulates the control data into the control data accumulation section 106, and then the control data synchronization section 104 takes out a plurality of

control data that have been accumulated by that time and have been multiplexed from the control data accumulation section 106 as one data, and the control data synchronization section 104 outputs the taken out control
5 date to the control data management section 102. After the outputting, the control data synchronization section 104 clears the control data accumulation section 106.

To put it concretely, for example, when "terminal ability information exchanging message" was input into
10 the control data synchronization section 104, because the "terminal ability information exchanging message" is a control data being at the last in the group 1, the control data synchronization section 104 accumulates the "terminal ability information exchanging message" into the control
15 data accumulation section 106, and then takes out "master slave determining message" and the "terminal ability information exchanging message" from the control data accumulation section 106 as one data to output them to the control data management section 102.

20 The multiplexed control data output to the control data management section 102 is output to the control data processing section 107 by the control data management section 102, and the output control data is temporarily stored in the multiplexed data accumulation section 108.
25 Then, the control data processing section 107 takes out multiplexed control data from the multiplexed data accumulation section 108 in order for each time when the

control data processing section 107 detects a reception acknowledgment signal transmitted from the communicating party, and the control data processing section 107 adds a sequence number, an error detection code and the like
5 to the taken out multiplexed data to generate the multiplexed data as one packet for each group. Consequently, the packet includes a plurality of transmission control data. After header information and other information are added to the generated packet in
10 the transmission section 109, the packet is processed in conformity with the prescribed radio processing to be transmitted to the communicating party through the antenna 110.

Next, a state of exchanges of control data by
15 communication terminals equipped with the communication apparatus having the aforesaid configuration, severally, is described. FIG. 4 is a sequence diagram showing a state of exchanges of control data by communication terminals equipped with the communication apparatus according to
20 Embodiment 1 of the present invention, severally.

In FIG. 4, at the timing (hereinafter, abbreviated to as "t") t1 and t21, communication terminals A and B respectively transmit control data A-1 and control data B-1 to the other parties of communication. Incidentally,
25 the description is performed in the following description on the basis of the operation of the communication terminal A for convenience of description.

The communication terminal A generates response data to an inquiry in control data B-1, which the communication terminal A received at t12, in the control data reception section 111. The response data is accumulated in the control data accumulation section 106.

Moreover, after the communication terminal A transmitted the control data A-1, the communication terminal A generates control data A-2 to be transmitted at the next time in the control data transmission section 103. The control data A-2 is accumulated in the control data accumulation section 106. Thereby, the response data and the control data A-2 are multiplexed.

Incidentally, now it is supposed here that the control data A-1 and the control data A-2 are control data that belong to different groups. Moreover, it is also supposed that the response data and the control data A-2 are control data that belong to the same group.

When the communication terminal B received the control data A-1 at t22, the communication terminal B transmits a reception acknowledgment signal 1 to the communication terminal A as a reply. Because it becomes possible for the communication terminal A that received the reception acknowledgment signal 1 at t13 to transmit the next data, the communication terminal A makes the data generated by the multiplexing of the response data and the control data A-2 one packet in the control data processing section 107, and the communication terminal

A transmits the packet to the communication terminal B at t13. By the transmission of a plurality of control data as one packet after the multiplexing of them, the number of times of transmission of control data can be reduced. Moreover, because the communication terminal A multiplexes the response data and the control data A-2 to one packet and then transmits the packet, the waiting time that was conventionally generated as shown in FIG. 1 can be shortened.

Then, when the communication terminal B received the packet including the response data and the control data A-2, the communication terminal B transmits a reception acknowledgment signal 2 to the communication terminal A at t23. The reception acknowledgment signal 2 is received by the communication terminal A at t14.

Incidentally, the communication apparatus according to the present embodiment may have a configuration shown in FIG. 5. FIG. 5 is a principal part block diagram showing another schematic configuration of the communication apparatus according to Embodiment 1 of the present invention. In the communication apparatus shown in FIG. 5, the control data management section 102 outputs an instruction signal concerning the inputting and the outputting of control data to the control data accumulation section 106 to the control data synchronization section 104 by reference to the correlation memory section 105.

The control data synchronization section 104 accumulates input control data into the control data accumulation section 106 or takes out accumulated multiplexed control data from the control data accumulation section 106 in a form of one data in conformity with the instruction signal.

As described above, the communication apparatus and the communication method according to the present embodiment correlates a plurality of control data that can collectively be transmitted and a plurality of control data that are asynchronously generated to each other, and the apparatus and the method multiplexes the plural control data in conformity with the correlation to transmit the multiplexed control data as one packet. Thereby, waiting time concerning the transmission of control data can be shortened and the number of times of exchanges of control signals can be decreased. Consequently, the delay of transmission starting of stream data caused by the waiting time can be reduced.

(EMBODIMENT 2)

The point of the communication apparatus and the communication method according to the present embodiment different from those of Embodiment 1 is that the apparatus and the method of the present embodiment further multiplexes a plurality of control data that were multiplexed in conformity with correlation to make them as one packet and then the apparatus and the method transmits

the packet.

Hereinafter, the communication apparatus and the communication method according to Embodiment 2 of the present invention are described by the use of FIG. 6 and FIG. 7. FIG. 6 is a principal part block diagram showing a schematic configuration of the communication apparatus according to Embodiment 2 of the present invention, and FIG. 7 is a sequence diagram showing a state of exchanges of control data by communication terminals equipped with the communication apparatus according to Embodiment 2 of the present invention, severally. Incidentally, in FIG. 6, the same configuration elements as those of Embodiment 1 are designated by the same reference marks as those of Embodiment 1, and their detailed descriptions are omitted.

Because the control data processing section 501 cannot transmit multiplexed control data until the control data processing section 501 receives a reception acknowledgment signal transmitted from the communicating party, as shown in FIG. 7, the control data processing section 501 successively accumulates multiplexed control data output from the control data management section 102 in the multiplexed data accumulation section 108 for a period of time until the control data processing section 501 receives the reception acknowledgment signal. Now, here, it is supposed that, for example, two multiplexed control data of multiplexed control data 1 and multiplexed control data 2 are accumulated. Thereby, a plurality of

control data that were multiplexed by the group are further multiplexed by a plurality of groups.

When the control data processing section 501 detects the reception of a reception acknowledgment signal at t13 shown in FIG. 7, the control data processing section 501 takes out all of the multiplexed control data (the multiplexed control data 1 and the multiplexed control data 2) that have been accumulated until that time from the multiplexed data accumulation section 108, and the control data processing section 501 adds a sequence number, an error detection code and the like to the taken out multiplexed control data to generate the added control data as one packet, and further the control data processing section 501 outputs the packet to the transmission section 108. Thereby, the control data multiplexed between a plurality of groups are transmitted to the communicating party as one packet. After outputting, the control data processing section 501 clears the multiplexed data accumulation section 108.

As described above, the communication apparatus and the communication method according to the present embodiment further multiplex a plurality of control data that were multiplexed in conformity of correlation to make the multiplexed control data one packet, and then the apparatus and the method transmit the packet. Thereby, the number of times of exchanges of control signals can further be reduced and the transmission efficiency of

control signals can be heightened in comparison with Embodiment 1. Consequently, necessary time before the transmission starting of stream data can further be shortened.

5

(EMBODIMENT 3)

The point of the communication apparatus and the communication method of the present embodiment different from those of Embodiment 2 is that the communication
10 apparatus and the communication method of the present embodiment do not transmit control data that were multiplexed between a plurality of groups at the time of receiving of a reception acknowledgment signal but transmit the multiplexed control data at a prescribed time interval.

15 Hereinafter, the communication apparatus and the communication method according to Embodiment 3 of the present invention are described by the use of FIG. 8 and FIG. 9. FIG. 8 is a principal part block diagram showing a schematic configuration of a communication apparatus
20 according to Embodiment 3 of the present invention, and FIG. 9 is a sequence diagram showing a state of exchanges of control data by communication terminals equipped with a communication apparatus according to Embodiment 3 of the present invention, severally. Incidentally, in FIG.
25 8, the same configuration elements as those of Embodiment 2 are designated by the same reference marks as those of Embodiment 2, and their detailed descriptions are omitted.

At some generation timing of multiplex control data, such as a case where the generation frequency of multiplexed control data is high, such a case can be conceivable as the next multiplexed control data is output from the control data management section 102 to the control data processing section 701 immediately after the control data processing section 701 received a reception acknowledgment signal. In this case, if the multiplexed control data output immediately after the reception of the reception acknowledgment signal is also included in one packet to be transmitted, the transmission efficiency can more be improved. Accordingly, the communication apparatus and the communication method according to the present embodiment are configured such that one packet is generated by including multiplexed control data output immediately after the reception of a reception acknowledgment signal, too.

When multiplexed control data 1 that is the first multiplexed control data is input into the control data processing section 701, the control data processing section 710, as shown in FIG. 9, accumulates the multiplexed control data 1 in the multiplexed data accumulation section 108, and the control data processing section 710 starts a timer 702.

Until the timer 702 expires, the control data processing section 701, as shown in FIG. 9, successively accumulates multiplexed control data output from the

control data management section 102 into the multiplexed data accumulation section 108. Now, here, it is supposed that, for example, three multiplexed control data of multiplexed control data 1-3 were accumulated during the
5 period of time from the starting of the timer 702 to the expiration of the timer 702.

After the control data processing section 701 received a reception acknowledgment signal at t13 shown in FIG. 9, the control data processing section 701 takes
10 out all the multiplexed control data (the multiplexed control data 1-3) that have been accumulated till that time from the multiplexed data accumulation section 108 at t14, the point of time when the timer 702 expired, and the control data processing section 701 adds a sequence
15 number, an error detection code and the like to the taken out control data to generate them as one packet, and further the control data processing section 701 outputs the packet to the transmission section 109. After outputting, the control data processing section 701 clears the multiplexed
20 data accumulation section 108, and restarts the timer 702.

Incidentally, the prescribed time set in the timer 702 is set in order that the transmission efficiency becomes highest under the consideration of the generation timing of multiplexed control data.

25 As described above, the communication apparatus and the communication method according to the present embodiment do not transmit control data that were

multiplexed between a plurality of groups at the time of the reception of a reception acknowledgment signal, but the communication apparatus and the communication method transmit the control data at a prescribed time interval.

5 Thereby, in a case where the generation frequency of multiplexed control data is high, or in similar cases, the number of times of exchanges of control signals can further be reduced, and the transmission efficiency of the control signals can be heightened in comparison with
10 Embodiment 2. Consequently, the period of time necessary before the transmission starting of stream data can further be shortened.

Incidentally, in the aforesaid Embodiment 1 to Embodiment 3, descriptions are given to the cases where
15 transmission paths are ones for radio communication, but the present invention does not limited such cases. The transmission paths may be ones for wired communication.

Moreover, when an error was generated during the transmission of control data, it becomes necessary to
20 retransmit the control data in which the error was generated. Consequently, the aforementioned Embodiment 1 to Embodiment 3 in which a plurality of control data are multiplexed to be one packet and the packet is transmitted are especially effective in a communication system such
25 that errors are easily generated. Moreover, by the use of the communication apparatus according to the aforesaid Embodiment 1 to Embodiment 3 on both of the transmission

side and the reception side, waiting times are likewise shortened on both the sides, and the gaps of operation timing on both the sides are eliminated. Thereby, real time two-way communication becomes possible.

5 Moreover, it is also possible to realize the aforesaid Embodiment 1 to Embodiment 3 by means of software. In addition, it is also possible to store the software in a memory medium for the execution by a computer after the reading out of the software.

10 As described above, the present invention can shorten a waiting time concerning the transmission of control data, and thereby can reduce the delay of the starting of the transmission of stream data.

15 This application is based on the Japanese Patent Application No. HEI 11-309005 filed on October 29, 1999, entire content of which is expressly incorporated by reference herein.

Industrial Applicability

20 The present invention is applicable to a base station apparatus used in a radio communication system and a communication terminal apparatus.

CLAIMS

1. A communication apparatus comprising:
an accumulator for accumulating a plurality of
control data for each multiplexing unit; and
5 a transmitter for transmitting multiplexed control
data generated by multiplexing a plurality of control data
for each multiplexing unit as one transmission unit after
reception of a reception acknowledgment signal from a
communicating party.
- 10 2. The communication apparatus according to claim
1, wherein said accumulator stores information for
correlating a plurality of control data with each other
to be stored as one multiplexing unit.
- 15 3. The communication apparatus according to claim
1, said apparatus further comprising a multiplexer for
accumulating a plurality of multiplexed control data
successively and for multiplexing a plurality of
multiplexed control data furthermore, wherein
said transmitter transmits a plurality of
20 multiplexed control data as one transmission unit.
4. The communication apparatus according to claim
3, said apparatus further comprising a timer for timing
a prescribed time repeatedly, wherein
said transmitter transmits a plurality of
25 multiplexed control data as one transmission unit for each
prescribed time.
5. A communication terminal apparatus mounted with

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an accumulator for accumulating a plurality of control data for each multiplexing unit; and

10 6. A base station apparatus mounted with a
communication apparatus, said communication apparatus
comprising:

15 a transmitter for transmitting multiplexed control data generated by multiplexing a plurality of control data for each multiplexing unit as one transmission unit after reception of a reception acknowledgment signal from a communicating party.

transmitting multiplexed control data generated by
multiplexing a plurality of control data for each

25 multiplexing unit as one transmission unit after reception
of a reception acknowledgment signal from a communicating
party.

8. The communication method according to claim 7, wherein a plurality of control data are multiplexed in conformity with information correlating a plurality of control data with each other to be accumulated as one
5 multiplexing unit.

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ABSTRACT

A correlation memory section 105 stores a prescribed table in which each control data is grouped for each kind of it (for each message unit) to be correlated to each other. A control data synchronization section 104 successively accumulates input control data into a control data accumulation section 106. At this time, the control data synchronization section 104 refers a table stored in the correlation memory section 105 to correlate a plurality of control data for each group for accumulating the control data. By such operation, a plurality of control data are multiplexed for each group, and the control data are handled by the group as one data. Then, a control data processing section 107 generates multiplexed control data that are multiplexed for each group as one packet, and the control data processing section 107 transmits the generated packet to a communicating party.

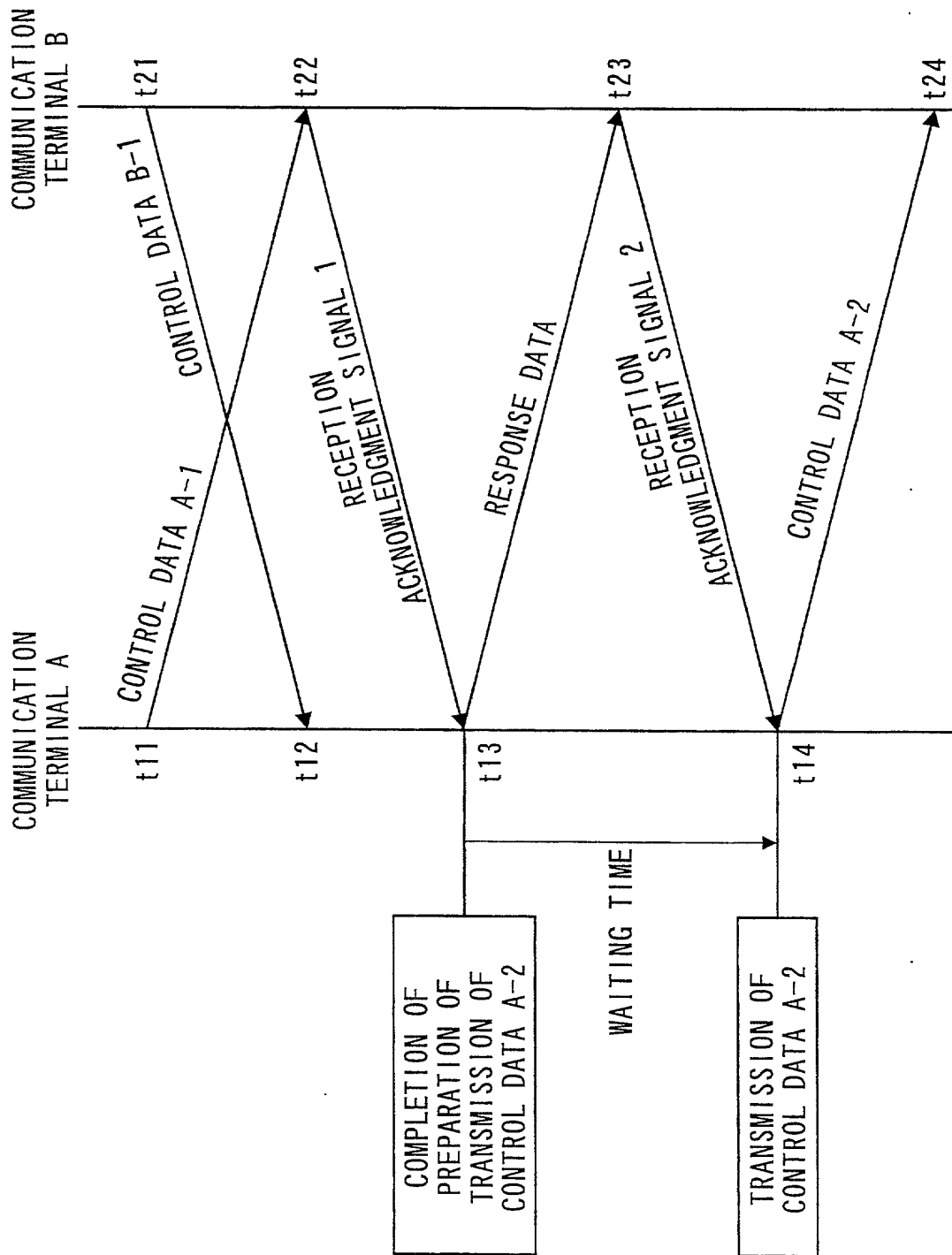


FIG. 1

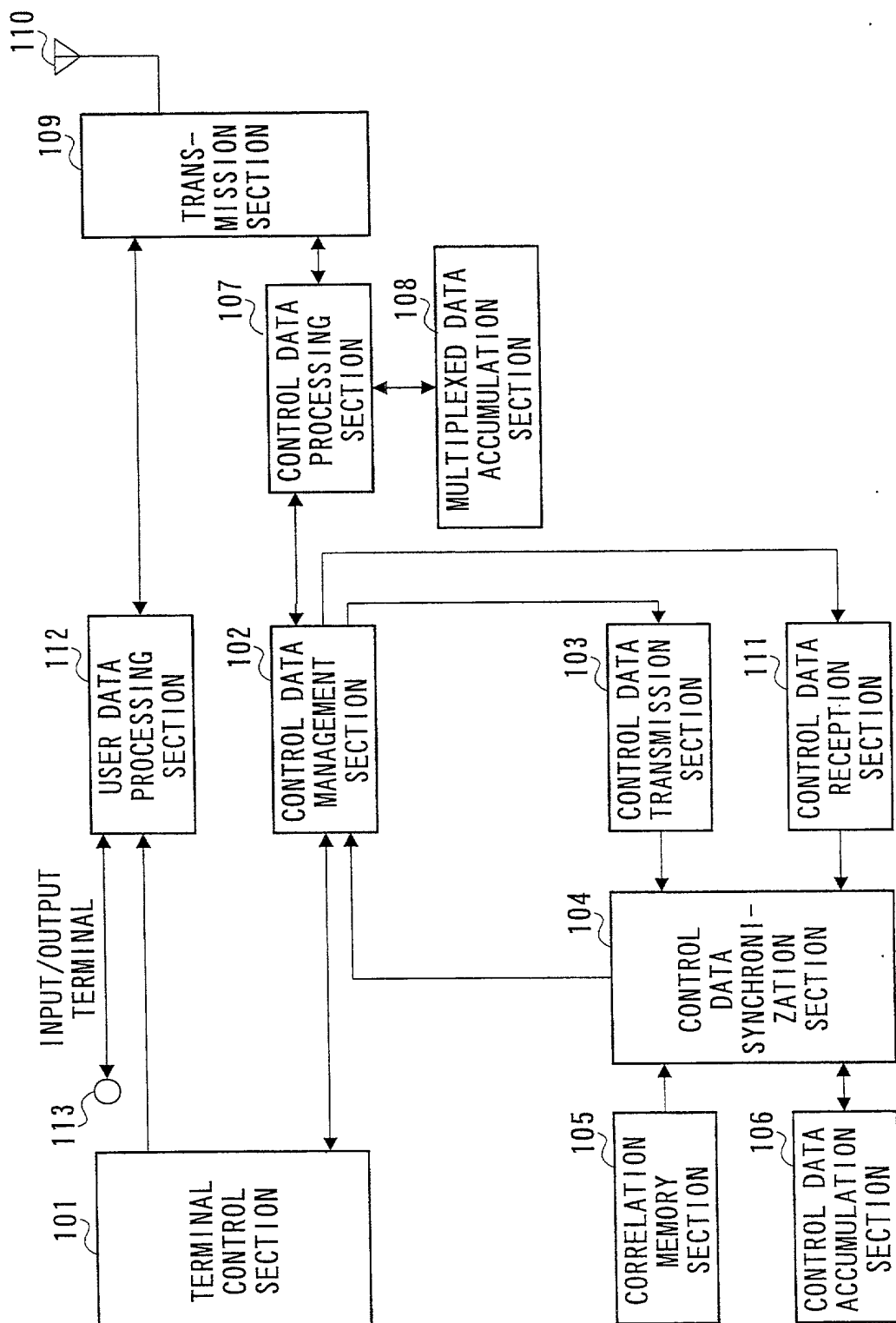


FIG. 2

3 / 9

GROUP 1	MASTER SLAVE DETERMINING	
	TERMINAL ABILITY INFORMATION EXCHANGING	
GROUP 2	LOGIC CHANNEL ESTABLISHING	(IMAGE)
	LOGIC CHANNEL ESTABLISHING	(VOICE)
	LOGIC CHANNEL ESTABLISHING	(DATA)
GROUP 3	MULTIPLEXED INFORMATION (IMAGE)	
GROUP 4	LOGIC CHANNEL ESTABLISHMENT RESPONSE	(IMAGE)
	LOGIC CHANNEL ESTABLISHMENT RESPONSE	(VOICE)
	LOGIC CHANNEL ESTABLISHMENT RESPONSE	(DATA)

FIG. 3

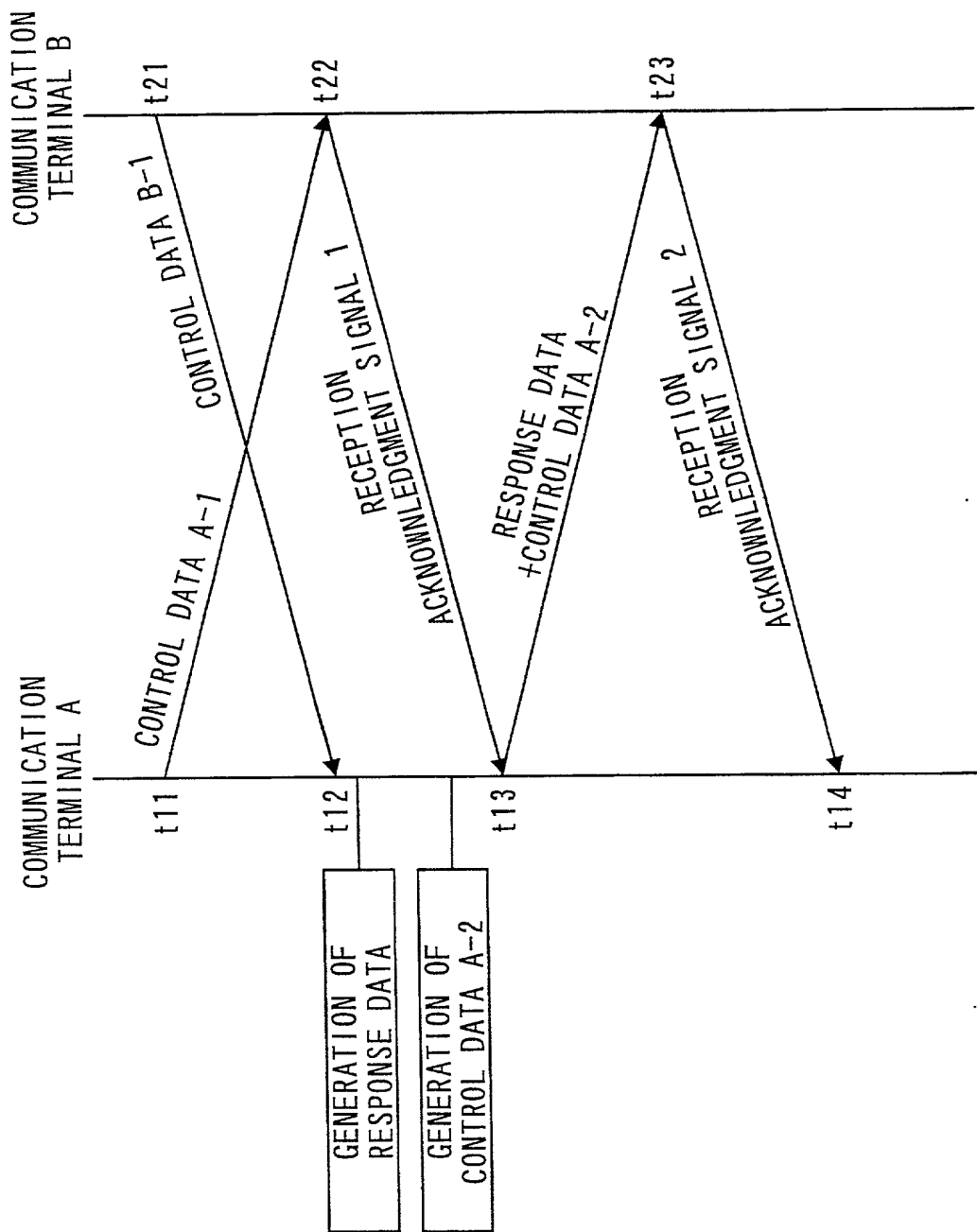


FIG. 4

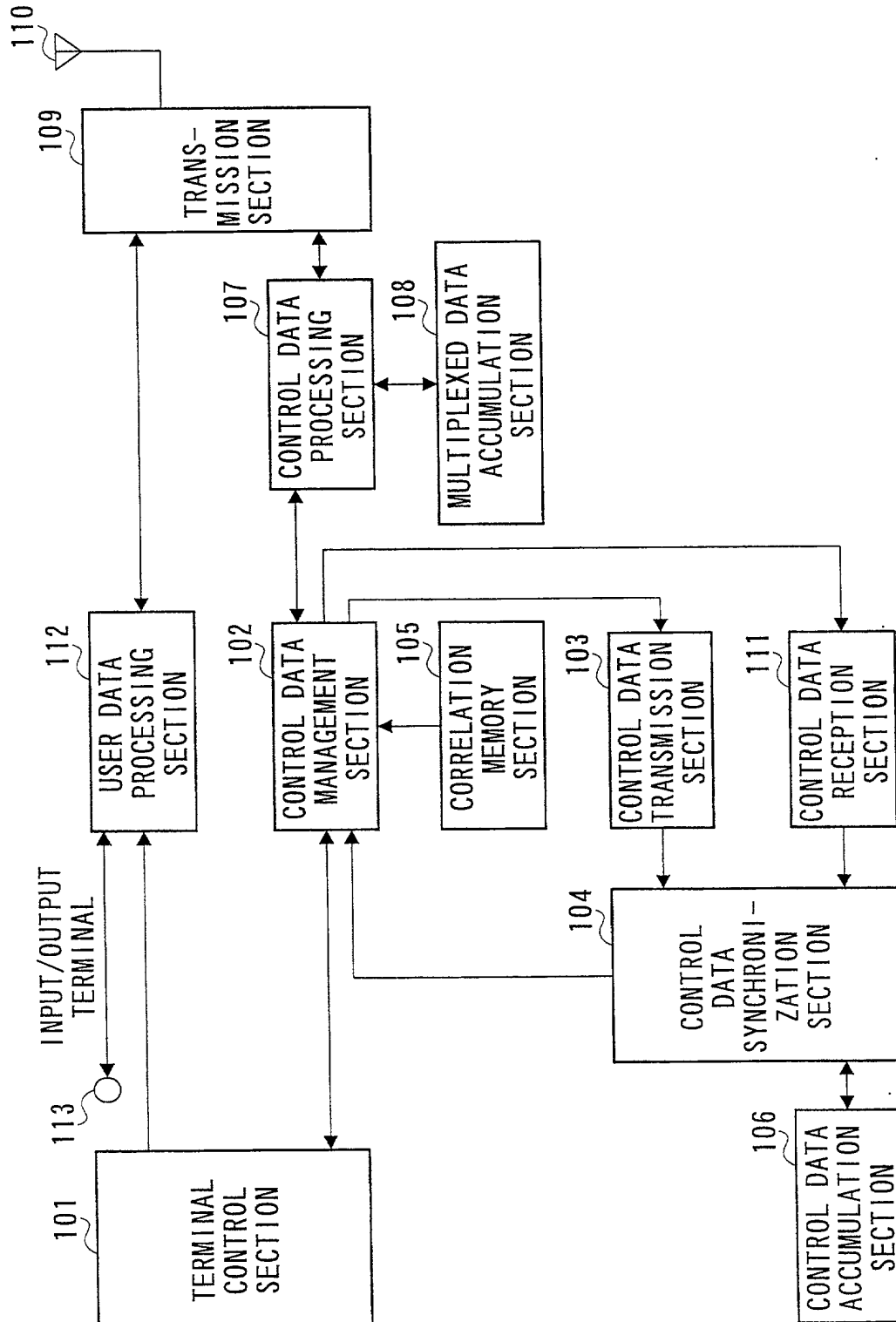


FIG. 5

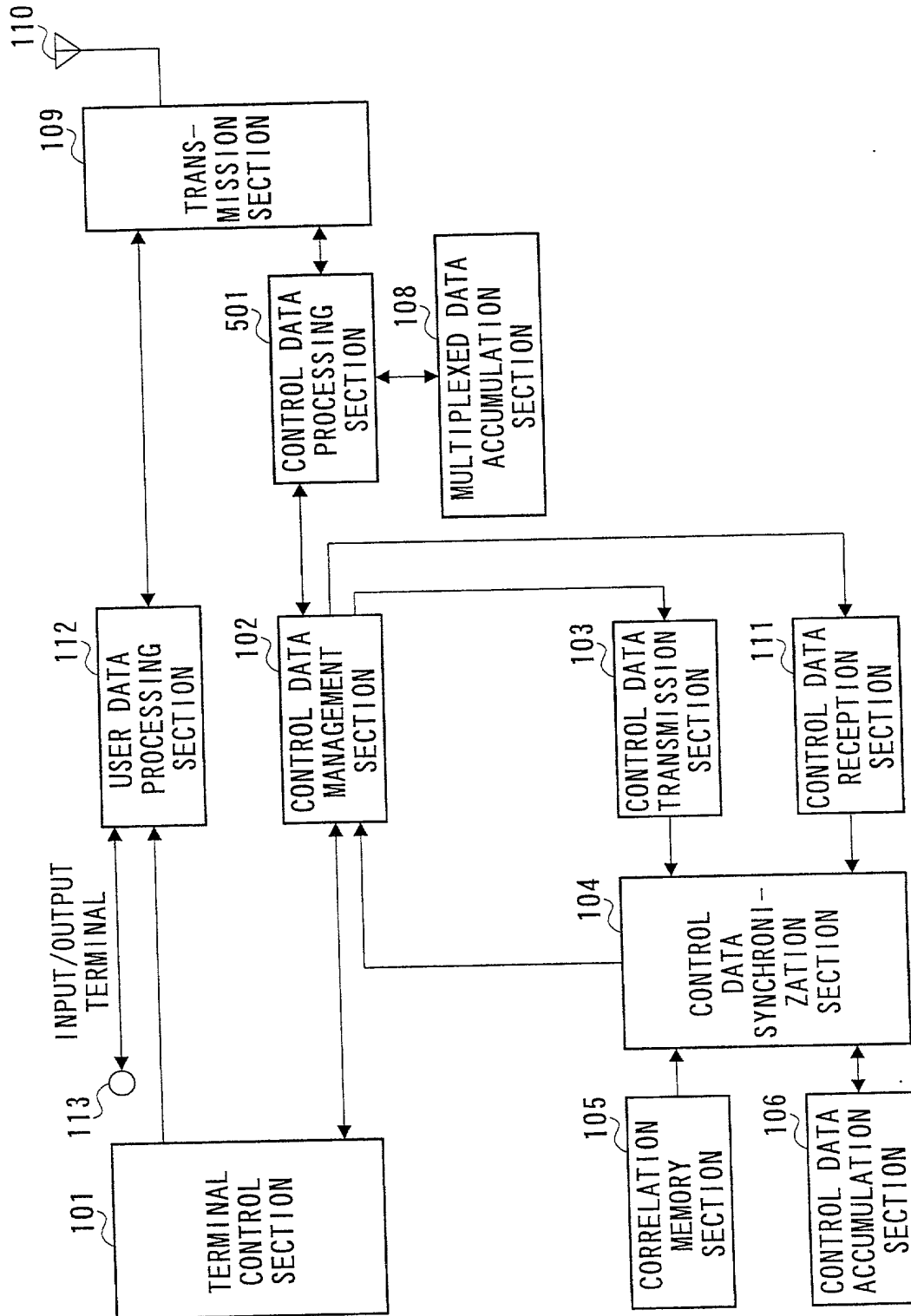


FIG. 6



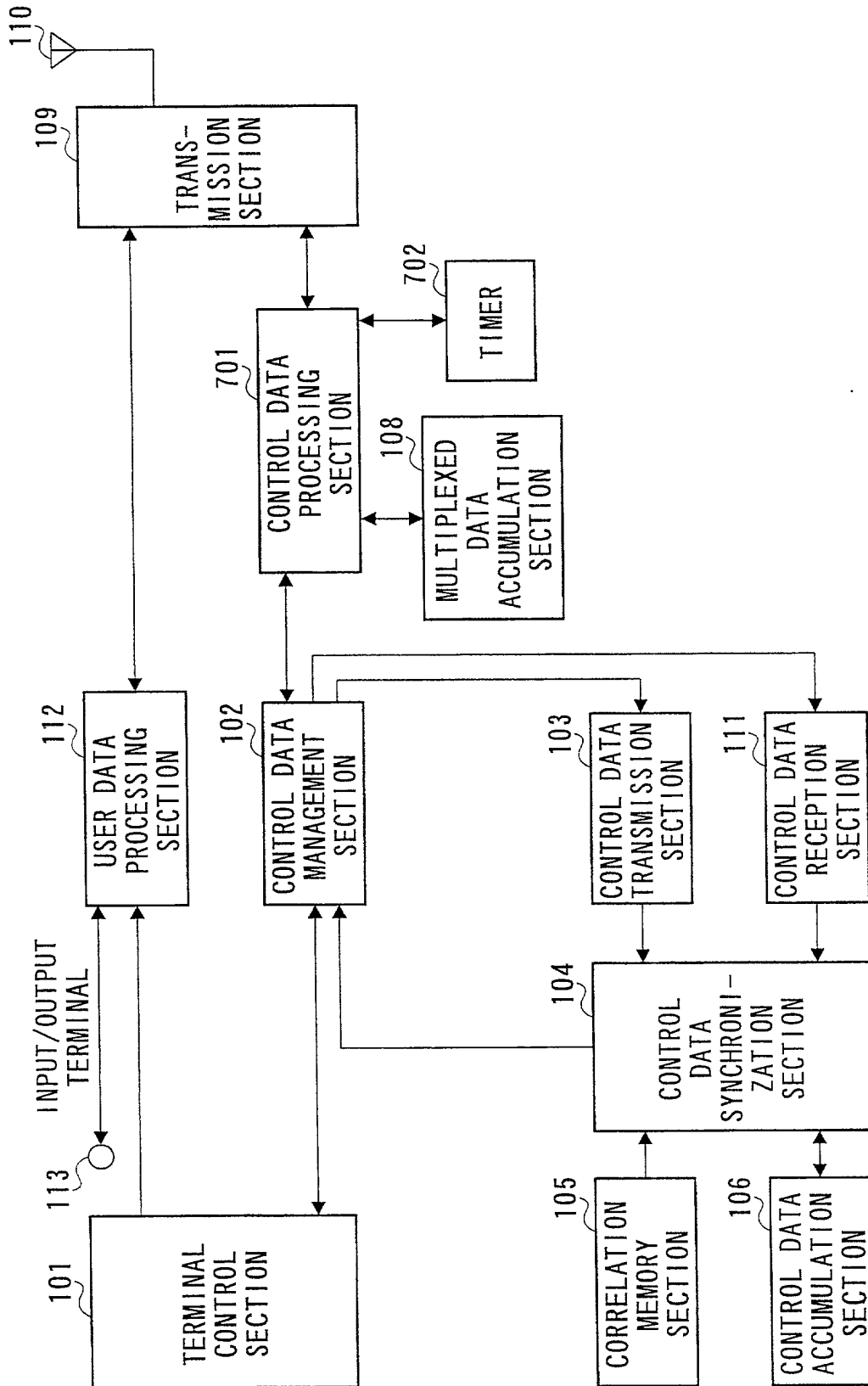


FIG. 8

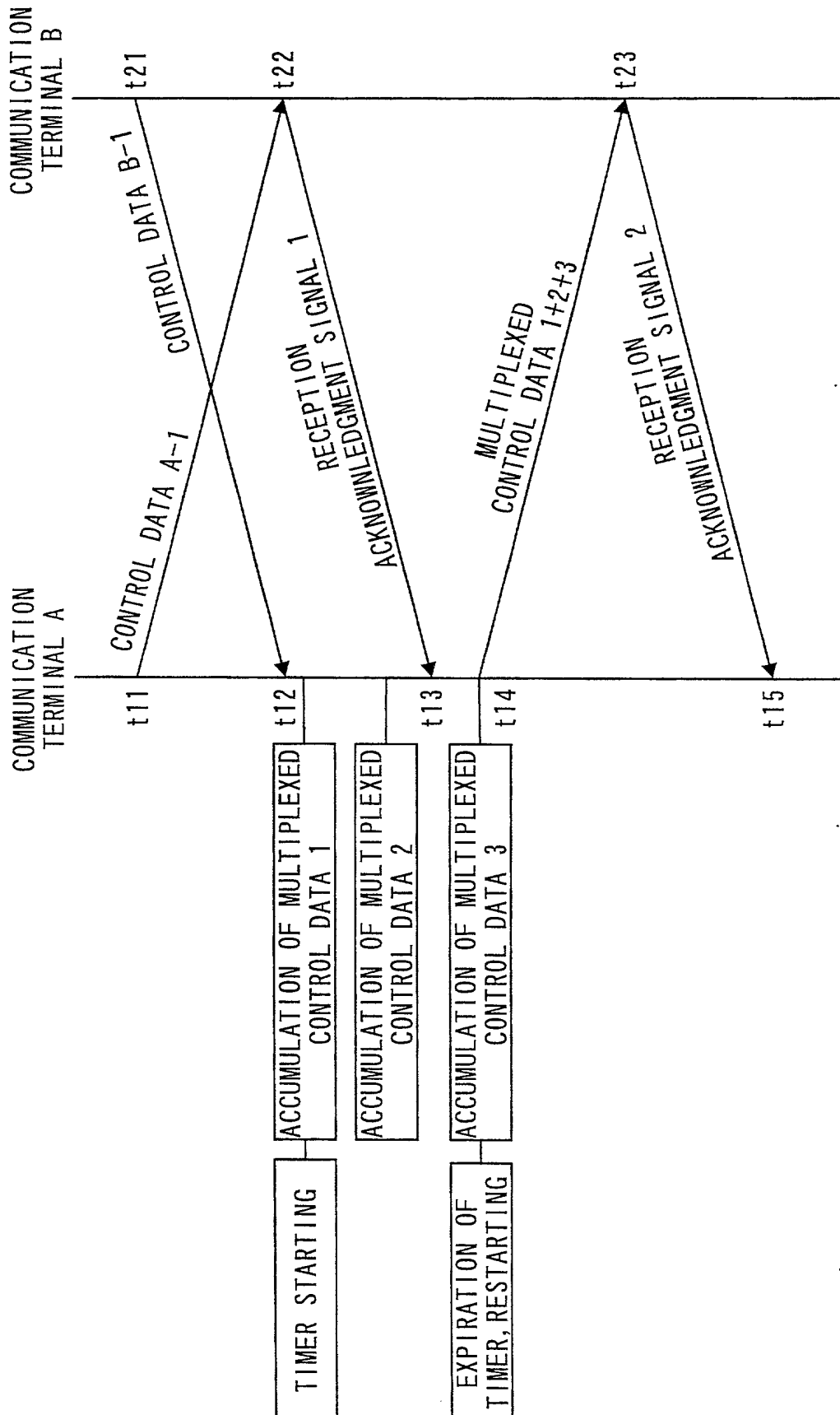


FIG. 9

**APPLICATION FOR UNITED STATES PATENT
Declaration for Patent Application**

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on

the invention entitled: COMMUNICATION APPARATUS AND COMMUNICATION METHOD

the specification of which 2 (file no _____)

(check at least one) 3 ☐ is attached hereto
4 ☒ was filed on June 27, 2001 as (5) U.S. Application Serial No. 09/869,267.
6 ☐ and was amended _____
(if applicable)

Use this portion only if you are entering the U.S. National phase based on a PCT International Application designating the U.S.

7 ☐ was filed as PCT international application
8 Number PCT/JP00/07536
9 on October 27, 2000
and was amended under PCT Article(s) 19 and/or 34
10 on _____ (if applicable).

I hereby declare that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended, by any amendment referred to above.

I acknowledge the duty to disclose to the United States Patent and Trademark Office all information known to me which is material to patentability in accordance with Title 37, Code of Federal Regulations, §1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application (s) for patent or inventor's certificate listed below and have also identified below any foreign application(s) for patent or inventor's certificate or any PCT international application(s) designating at least one country other than the United States of America filed by me on the same subject matter having a filing date earlier than that of the application(s) on which priority is claimed.

Prior (Foreign) Application(s) any Priority Claims Under 35 U.S.C. 119 Priority Claimed

1a Japan JP11-309005 29/October/1999 ☒ ☐
(Country) (Number) (Day/Month/Year Filed) Yes No

(Country) (Number) (Day/Month/Year Filed) ☐ ☐
Yes No

☐ Additional foreign application numbers are listed on a supplemental priority data sheet attached hereto.

Priority Claim(s) from U.S. Provisional Application(s) – I hereby claim the benefit under Title 35, United States Code, §119(e) of any United States provisional application(s) listed below:

11b Application No. Day/Month/Year Filed Application No. Day/Month/Year Filed

Do not use this portion to identify a PCT application if the parent application is the U.S. National phase of the PCT application

I hereby claim the benefit under Title 35, United States Code, 120 of any United States application(s) or PCT international application(s) designating the United States of America that is/are listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in that/those prior application(s) in the manner provided by the first paragraph of Title 35, United States Code §112, I acknowledge the duty to disclose to the United States Patent and Trademark Office all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, §1.56 which became available between filing date of the prior application and the national or PCT international filing date of this application.

13 _____
(U.S. Application Number) (U.S. Filing Date) Status (patented, pending, abandoned)

I hereby appoint the following attorneys of the firm of Stevens, Davis, Miller & Mosher, L.L.P. as my attorneys of record with full power of substitution and revocation to prosecute this application and to transact all business in the Patent and Trademark Office:

James E. Ledbetter, Reg. No. 28732; Thomas P. Pavelko, Reg. No. 31689; and Anthony P. Venturino, Reg. No. 31674.

**ALL CORRESPONDENCE IN CONNECTION WITH THIS APPLICATION SHOULD BE SENT TO
STEVENS, DAVIS, MILLER & MOSHER, L.L.P., 1615 L Street, N.W., Suite 850, Washington, D.C. 20036,
TELEPHONE (202) 408-5100, FACSIMILE (202) 408-5200.**

See page 2 for signature lines

INSTRUCTIONS FOR COMPLETION OF THIS FORM

line 1 Insert the same title as is used on the specification and in the assignment.

line 2 Is optional but is provided so that you can use it to identify more readily an application prior to the time that the Patent Office application serial number is assigned. We suggest that the specification, drawings and declaration always bear a file number since it can help to get the papers together in case they become inadvertently separated. In instances where the specification is filed without a signed declaration form (under 37 CFR §1.53) a file number on a later-received separate form will assist us in associating it with the correct case.

line 3 Check this box if the specification, claims and drawing (if any) are attached to this declaration form, e.g., when filing a new patent application.

lines 4-5 Are only used in an instance where the application is already on file and the declaration from is being separately filed, e.g., when the application was originally filed without a signed declaration or where the Patent Office has required a new declaration because of a deficiency in the original declaration. In such an instance the Patent Office will require that lines 4 and 5 be completed with the filing date and application serial number already assigned.

line 6 Is used in conjunction with line 5 but only when there have been one or more amendments to the specification or claims. Line 6 is also used when the Examiner requires a new declaration because claims inserted by amendment cover subject matter not originally claimed (37 CFR §1.67).

lines 7-11 Are for PCT (Patent Cooperation Treaty) cases and are used only when you are entering the U.S. National phase (Chapter I or II) based upon a previously filed PCT International application designating the U.S.

line 7 Check this box if this is a PCT National Phase application.

line 8 Insert PCT International application number.

line 9 Insert date of filing of PCT International application.

lines 10-11 Insert the date of all amendments filed in the PCT International application. Such amendments are optional, so this line at times will not be used.

line 12a Is used in the following instances:

(i) If a single priority is being claimed from a foreign application you need to list only the first-filed application; you do not need to list other countries if all applications were filed within one year of the U.S. filing.

(ii) If multiple priorities are being claimed, from a plurality of applications filed in one or more countries, you must list the first filed application for each aspect of the invention. Example: if aspect A of the invention was disclosed in an application filed 11 months earlier in country X and aspect B was disclosed 9 months earlier in an application filed in country Y, then the applications in both countries X and Y must be identified. Only the first application for each aspect of the invention needs to be identified provided all applications on that aspect were filed within one year prior to the U.S. filing.

(iii) If a non-priority application is being filed you must list all applications in all countries where corresponding foreign applications were filed more than one year prior to the U.S. filing. This is so the Examiner can check to see if any of those applications were published or patented early enough to be prior art against the U.S. application.

(iv) If there are more than two applications to be listed we suggest that you type in on this form only "See attached Schedule A" and then list all of the previous applications on an attached sheet.

line 12b Is used to claim priority under 35 USC §119(e) based on a provisional application filed within one year of the filing of the instant application. More than one provisional application may be identified provided neither was filed more than one year earlier.

line 13 This block is used only in instances where there is a previously filed U.S. non-provisional application which was copending at the time the present application was (or is being) filed. That previous application could be a U.S. non-provisional application or the National Phase of a PCT allocation. In such a case the present application may be entitled to the priority of the previous application's U.S. filing date (and consequently the foreign priority thereof) provided the present application is identified as a continuing application (continuation, divisional or continuation-in-part) of the earlier (parent) application. If the foregoing is applicable, please fill in one line for each such prior application.

line 14 Type the inventor's proper legal name in the order specified, e.g., "John B. JONES" or "J. Bob JONES" if the inventor so prefers. It is not acceptable to use only initials such as "J. B. JONES."

line 15 The inventor's "signature" may be his (or her) usual manner of signing but it is preferable that the inventor simply write his (or her) name in his (or her) own cursive handwriting in the same order as on line 14, e.g., given name, middle initial and Family name.

line 16 Insert the actual date of signature.

line 17 Insert simply the city and state or country, e.g., "Paris, France", of the inventor's residence, not citizenship. No street address or postal code is required on this line.

line 18 Insert the inventor's citizenship. The statement of citizenship (or subject of) is a statutory requirement (35 USC §115). Simply the name of the country of citizenship, e.g., "Japan" is sufficient.

line 19 Insert the inventor's mailing address. The purpose of requiring the post office address is to enable the Patent Office to communicate directly with the inventor if desired, such as in the case of death of the U.S. attorney. It should be the address where the inventor customarily receives his (or her) mail and should include the postal code. If applicable it can be the inventor's business address or address at place of employment.

Applicants are reminded that the U.S. Patent and Trademark Office has very strict requirements as to proper execution of an application. The applicant should make sure that he reviews the declaration, prior to signing to make sure the declaration properly identifies the application and all relevant information; and should review the specification and claims (including drawings, if any) before signing the declaration. Failure to do so will require the filing of a supplemental declaration --- 37 CFR §1.67(c).

Any handwritten changes to the specification, claims or drawings must be in ink personally by all of the inventors prior to signing the declaration and the adjacent left margin must be initialed and dated by all of the inventors, e.g., "JB 6-9-91".

Please let us know if there are any questions regarding proper completion of this form. Thank you.

An assignment, a separate document requiring separate signature and dating may be enclosed. Please look for it and sign and date it in the same manner as in lines 15 and 16 above.

STEVENS, DAVIS, MILLER & MOSHER, L.L.P.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful statements may jeopardize the validity of the application or any patent issuing thereon.

PAGE 2 OF U.S.A. DECLARATION FORM

14a	Typewritten Full Name of Sole or First Inventor	<u>Yoji</u>	<u></u>	<u>YOKOYAMA</u>
		Given Name	Middle Name	Family Name
15a	Inventor's Signature	<u>Yoji</u>	<u></u>	<u>Yokoyama</u>
16a	Date of Signature	<u>June</u>	<u>29</u>	<u>2001</u>
		Month	Day	Year
17a	Residence	<u>Yokosuka-shi</u>	<u>Kanagawa</u>	<u>JAPAN</u>
		City	State or Province	Country
18a	Citizenship	<u>JAPAN</u>		
19a	Post Office Address (Insert complete mailing address, including country)	<u>3-21-15-302, Nobu,</u> <u>Yokosuka-shi, Kanagawa 239-0841 JAPAN</u>		
14b	Typewritten Full Name of Sole or First Inventor			
		Given Name	Middle Name	Family Name
15b	Inventor's Signature			
16b	Date of Signature			
		Month	Day	Year
17b	Residence			
		City	State or Province	Country
18b	Citizenship			
19b	Post Office Address (Insert complete mailing address, including country)			
14c	Typewritten Full Name of Sole or First Inventor			
		Given Name	Middle Name	Family Name
15c	Inventor's Signature			
16c	Date of Signature			
		Month	Day	Year
17c	Residence			
		City	State or Province	Country
18c	Citizenship			
19c	Post Office Address (Insert complete mailing address, including country)			
14d	Typewritten Full Name of Sole or First Inventor			
		Given Name	Middle Name	Family Name
15d	Inventor's Signature			
16d	Date of Signature			
		Month	Day	Year
17d	Residence			
		City	State or Province	Country
18d	Citizenship			
19d	Post Office Address (Insert complete mailing address, including country)			

*Note to Inventor: Please sign name on line 15 exactly as it appears in line 14 and insert the actual date of signing on line 16. If there are more than four inventors, please add a copy of this page for identification and signatures for the additional inventors.